Microsoft

Operating System

Remote OS Installation

Beta 3 Technical Walkthrough

Abstract

The Microsoft® Windows® 2000 operating system Remote OS Installation feature was created based on customer feedback regarding the ability to deploy an operating system, throughout the enterprise, without the need to physically visit each client computer. One of the most challenging and costly functions performed by information technology (IT) staff today is the deployment of a new operating system to new or existing client computers. The Remote Installation Services (RIS) leverage the new Dynamic Host Configuration Protocol (DHCP)-based remote boot technology to assist IT staff with the deployment of Windows 2000 Professional in a remote way. This reduces and, in some cases, eliminates the need to visit the desktop to perform the operating system installation.

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CONTENTS

INTRODUCTION

Remote Installation Services (RIS) is an optional component that ships as part of the Microsoft® Windows® 2000 Server operating system. This document outlines the steps necessary to install, configure, and use RIS. RIS requires several other services that ship as part of Windows 2000 Server. The following services can be installed on individual servers or all on one server:

- Domain Name Service (DNS) Server
- Dynamic Host Configuration Protocol (DHCP) Server
- Active Directory™ directory service

Remote Installation Services was designed to reduce the costs incurred by organizations that must either preinstall the client computer or physically visit each client to install the operating system (OS). By combining RIS with other Microsoft IntelliMirror™ management technologies features—User Data Management, Software Installation and Maintenance, and User Settings Management—companies benefit from better disaster recovery with easier OS and application management, resulting in fewer calls to help desk staff.

Prerequisites

As noted above, RIS requires other services to function. To ensure a successful installation, it is important that you install and configure these services as outlined below. Please make sure that you have both the Windows 2000 Beta 3 Server and Professional CDs available before continuing.

Step 1. Ensure that both your server and client hardware meet the remote installation hardware requirements. Please see Appendix A for specific information regarding Remote OS Installation hardware requirements.

Step 2. Install Windows 2000 Server as a stand-alone server. Select the **Remote Installation Services** option from the Optional Components list during the server installation. You can also add the Remote Installation Services after the server has been installed. To install the RIS server after the server has been installed, select the **Add/Remove Programs** option within the Control Panel. Select the **Add/Remove Windows Components** option, and click the **Next** button to start the optional component wizard. Check the **Remote Installation Services** optional component from the list of available options, and click **Next** to copy the files required for the RIS service.

Note If you are also installing DHCP and DNS services on this server computer, you should select those optional components from within the optional component wizard.

If you have completed the Change and Configuration Management common infrastructure walkthrough, you do not need to perform steps 3 through 4. If you have not completed the common infrastructure walkthrough, be sure to complete all steps.

Step 3. Install and configure the DNS Server Service. If you have an existing Windows 2000-supported DNS server on your network, this step is not necessary. Please see the online documentation on installing and configuring the DNS service.

Step 4. Promote the server to a domain controller using the DCPROMO application. If you already have an existing Windows 2000 Server Domain Controller, this step is not necessary. Please see the online documentation on promoting a stand-alone server to a domain controller.

Step 5. Install and configure the DHCP Server Service. If you have an existing Windows 2000-supported DHCP server on your network, this step is not necessary. Please see the online documentation on installing and configuring the DHCP service. Ensure that you authorize the DHCP server within the Active Directory, or the DHCP service will fail to provide IP addresses to client computers.

Step 6. Once you have successfully installed the DHCP and DNS servers and you are finished promoting the server to a domain controller, you are ready to complete the installation of Remote Installation Services. Please see the section below titled, "Installing the Windows 2000 Remote Installation Services."

Domain Name Service (DNS) Server

Remote installation relies on DNS for locating both the directory service and client machine accounts. You should install the DNS Server Service that ships with Windows 2000 Server for RIS to function correctly. Support for other DNS servers will be tested in later releases of Windows 2000 Server.

Dynamic Host Configuration Protocol (DHCP) Server

RIS requires a DHCP server to be present and active on the network. The remote boot-enabled client computers receive an IP address from the DHCP server prior to contacting RIS. You can install the new DHCP Server that ships with the Microsoft Window NT® Server operating system, or you can use an existing DHCP server running Windows NT Server 4.0.

Active Directory

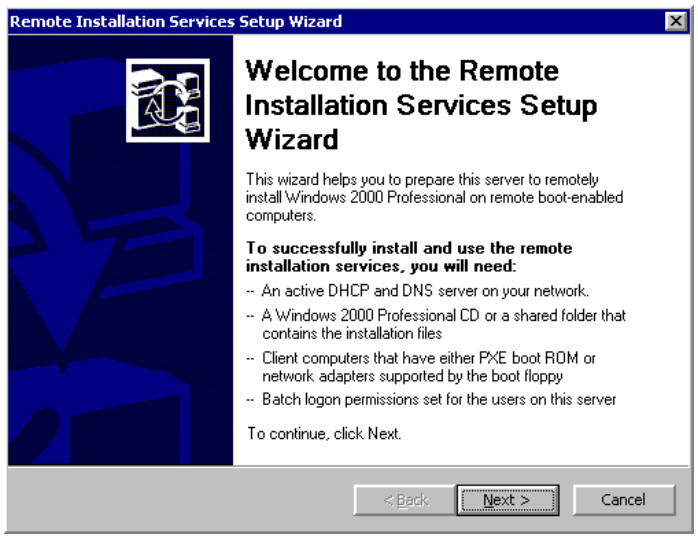
RIS relies on the new Windows 2000 Active Directory directory service for many things. RIS uses Active Directory for locating existing client machines as well as existing RIS servers. RIS must be installed on a Windows 2000-based server that has access to the Active Directory. This can be a domain controller or a server that is a member of a domain with access to the Active Directory.

INSTALLING THE WINDOWS 2000 REMOTE INSTALLATION SERVICES

The following instructions will help you to install, configure, and use the Windows 2000 Remote Installation Services. Before proceeding, please ensure that you have met all of the prerequisites outlined in the previous section.

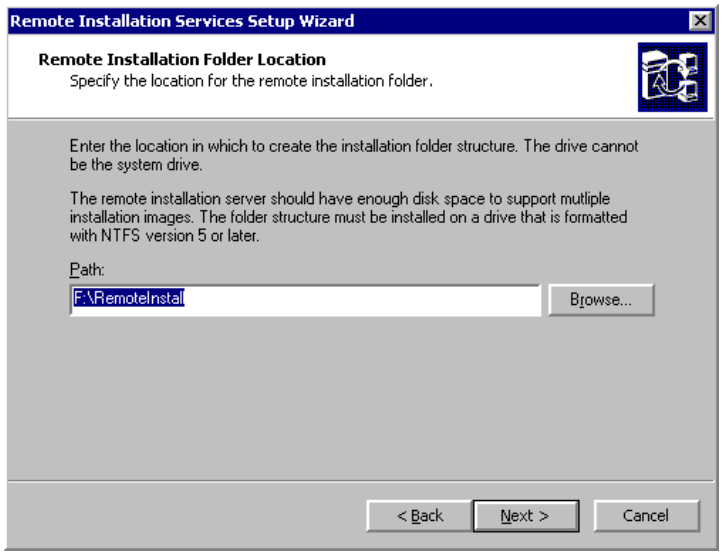
To set up Remote Installation Services

1. From the **Start** menu, select **Run** and type **RISetup.exe**. This starts the Remote Installation Services (RIS) Setup wizard.
2. The Welcome screen below appears, indicating some of the requirements for successfully installing RIS. Click **Next.**

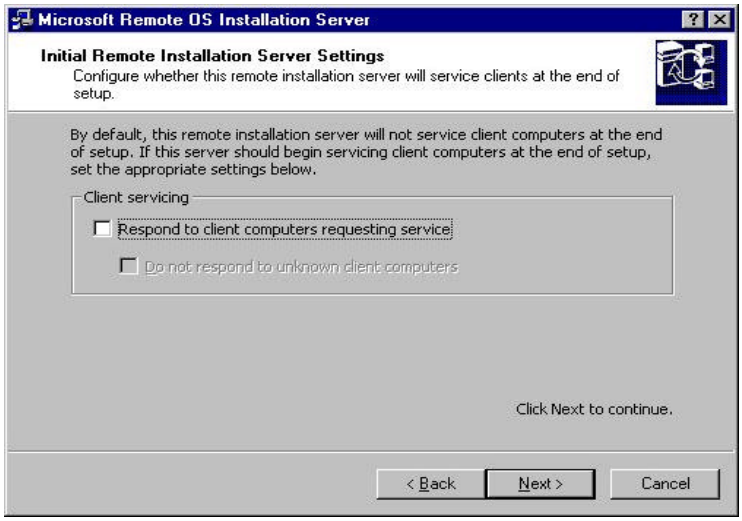


3. The next screen prompts you to enter the server drive and directory where you would like to install the RIS files. Enter the drive and directory, and click **Next**.

   Note The drive you choose to install RIS to must be formatted with the NTFS file system. Be aware that RIS requires a significant amount of disk space and cannot be installed on the same drive/volume that Windows 2000 Server is installed on. Ensure the drive chosen contains enough free disk space for at least one full Windows 2000 Professional compact disc (approximately 800 MB–1GB at a minimum).



4. The setup wizard prompts you to either enable RIS at the end of setup or to disable the service, allowing modification of specific server options prior to servicing client computers.

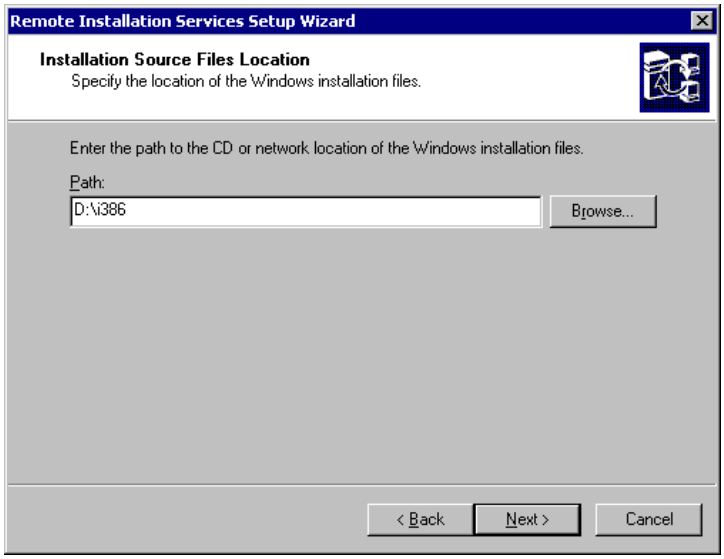


The options offered are:

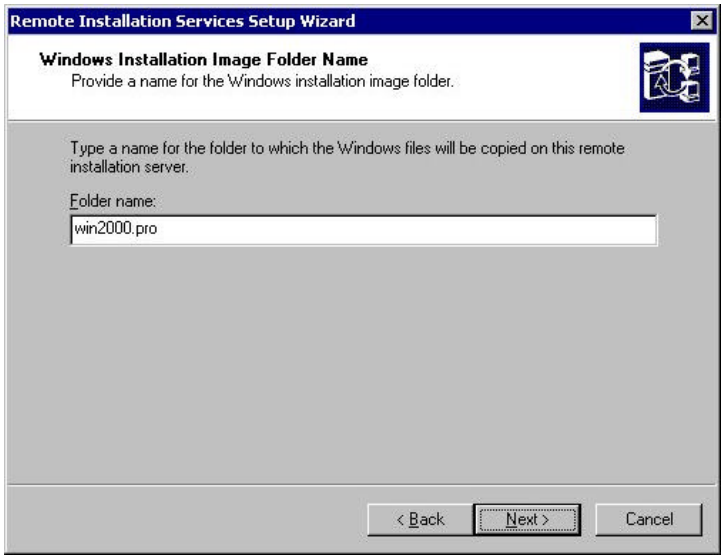
- **Respond to clients requesting service**. This option controls whether this RIS server responds to client computers requesting service at the end of setup. If this option is checked, the server will respond to clients and provide them with OS installation options. If unchecked, this RIS server will not respond to clients requesting service.
- **Do not respond to unknown client computers**. This option controls whether this server will respond to unknown client computers requesting a remote installation server. A client computer is known if the client computer has an existing computer account object created within the Active Directory. This allows the administrator the ability to only offer authorized—that is, those computers that have been prestaged within the Active Directory—the OS installation options from this RIS server. This setting also provides support for multiple Remote Boot/Install servers from different vendors on one physical network. For example, if your company already uses another vendor's remote install/boot server, you cannot control which vendors' server answers the client computers request. By setting this option and prestaging client computers, you are assured that this RIS server will only service those client computers.

Select the appropriate settings, and click **Next**.

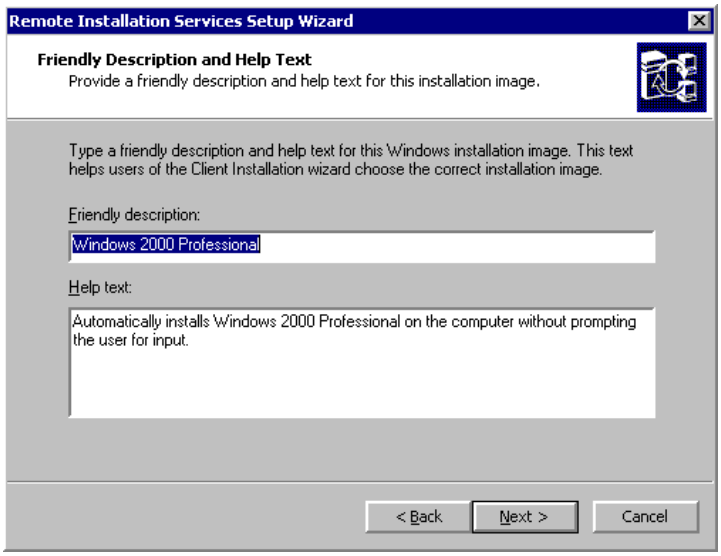
5. The setup wizard prompts you for the location of the Windows 2000 Professional installation files. RIS only supports remotely installing Windows 2000 Professional on client computers. Therefore, the wizard prompt for either the Windows 2000 Professional compact disc or a network location that contains the installation files. Type the drive letter containing the Windows 2000 Professional compact disc and the correct directory for the platform you are installing (for example, D:\i386) or browse to a network share that contains the installation source files. Click **Next**.



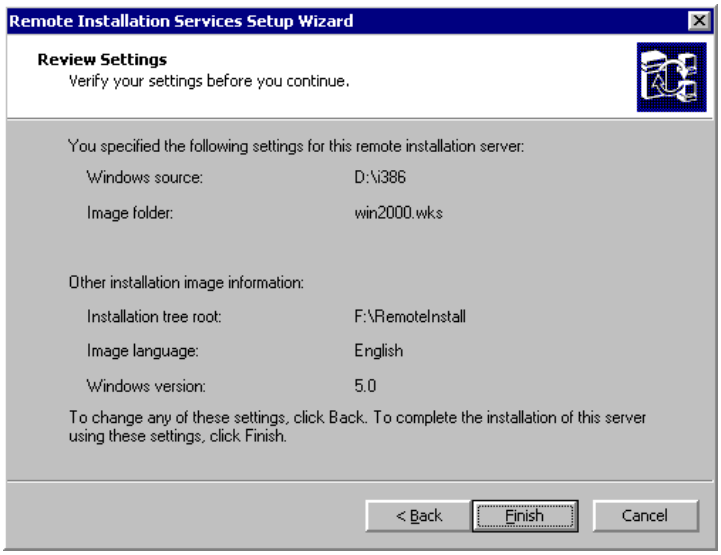
6. The wizard prompts you for a directory name that the workstation files should be copied to on the remote installation server. The workstation directory name is created under the directory that you provided in step 3 above. Name the directory something that represents the OS you are copying, for example, *Win2000.pro*. Click **Next**.



7. You are prompted for a friendly description and help text describing this OS image. The friendly description and help text is displayed to users or IT staff within the client installation wizard, OSChooser, at initial startup on a remote boot-enabled client. Enter a description that describes the OS installation, for example, if this workstation OS will be tailored to sales staff, then a friendly description may be **Windows 2000 Professional for Sales Staff**. The help text is displayed when the user selects the friendly description within the Client Installation wizard. Again, you should provide clear help text to your users to ensure they choose the correct OS option at install time. Click **Next**.



8. At this point, the setup wizard has gathered enough information. You are presented with the following summary screen indicating the choices you have made. To change any of the items, click **Back** and correct your entries. Click **Finish** to confirm your choices. Once the installation wizard completes, you are ready to either service client computers or configure the RIS service settings.



Now that RIS is successfully installed, you must authorize the RIS server within the Active Directory. If you do not authorize the RIS server, it will fail to service client computers requesting a network service boot. The next section outlines the steps necessary to authorize the RIS server within the Active Directory.

AUTHORIZING THE RIS SERVER WITHIN THE ACTIVE DIRECTORY

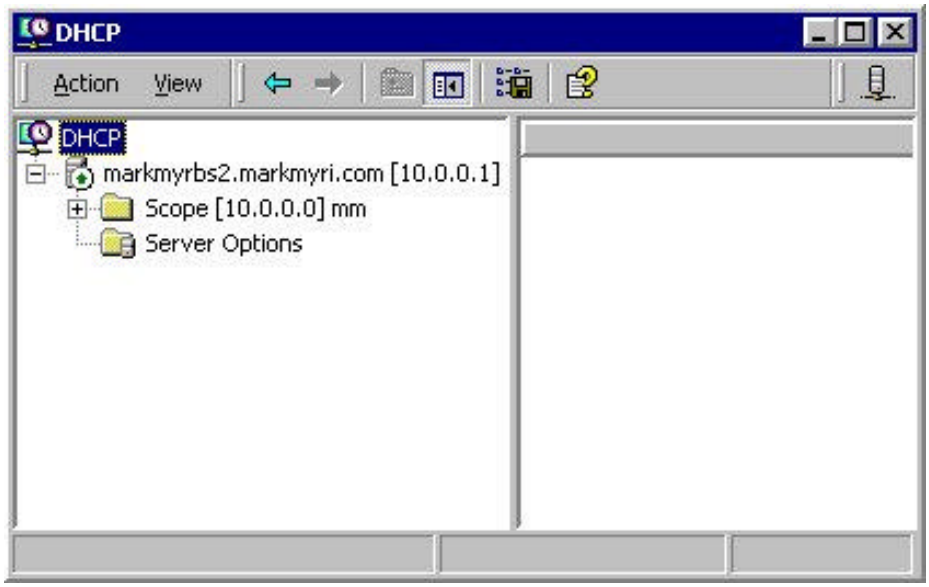
RIS allows you to control which RIS servers can service client computers on the network. For a RIS server to run, it must first be authorized within the Active Directory. If the RIS server is not authorized within the Active Directory, client computers requesting service will not be able to contact the RIS server and will not be answered.

To authorize a RIS server within the Active Directory, you must be logged on as a domain administrator on the domain where you will be authorizing the RIS server. You can complete the following steps on a domain controller, member server of the domain, or a Windows 2000 Professional workstation that has installed the Administrator Tools Package that contains the DHCP Server Management snap-in.

If RIS has been installed on an existing DHCP server that has already been authorized with the Active Directory, you do not need to perform the steps outlined below. If, however, you have installed RIS on a server that is not an authorized DHCP server, you must complete all steps.

To authorize a RIS server within the Active Directory

1. Ensure that you are logged as a domain administrator on the domain where the RIS servers will be servicing client computers.
2. Start the DHCP Management MMC snap-in. From the **Start** menu, point to **Programs**, then point to **Administrative Tools**, and click **DHCP Manager**. The following dialog box appears:



3. Right-click the word **DHCP** in the upper-left corner of the DHCP screen, and choose the **Browse Authorized Servers…** option. Click **Add,** and enter the IP address of the RIS server. Click **Yes** when prompted to verify that the address is correct.

At this point, your RIS server is authorized within the Active Directory and is now able to respond to client computers requesting service.

Now that RIS is successfully installed and authorized within the Active Directory, you are ready to configure the RIS settings prior to servicing client computers on your network. If you are using the default RIS configuration settings, review the section titled “Prerequisites for Client Installations,” below, prior to booting the first client computer.

CONFIGURING REMOTE INSTALLATION SERVICES

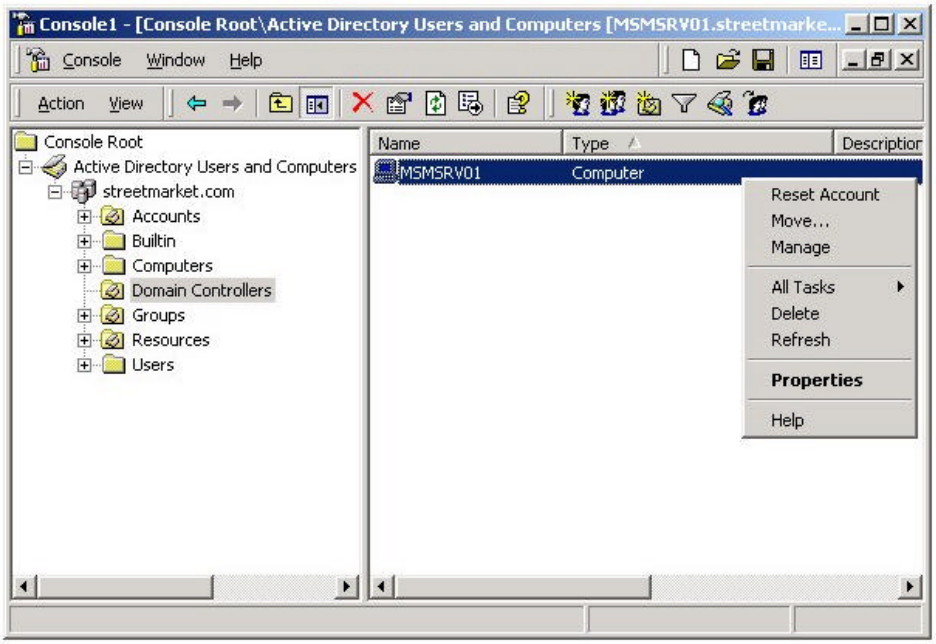
The following section outlines the specific RIS configuration options that can be configured.

To administer the RIS server

1. From the RIS server console, start the Directory Management snap-in.
2. From the **Start** menu, point to **Programs**, then point to **Administrative Tools**, and then click **Active Directory Users and Computers**.

Once the Directory Management snap-in starts, you are presented with your Active Directory Service tree, which contains default containers and organizational units.

Note You can administer the majority of the RIS configuration settings from a Windows 2000 Professional client. To administer a RIS server from a Windows 2000 Professional client, install the Administrator Tools package that ships as part of the Windows 2000 Server CD. The Administrator Tools package can be deployed or installed from the <Windir>\System32 directory on the server. The tools package file name is AdminPak.msi.



To configure the RIS server settings, there are two areas of administration that you need to be aware of:

- You can configure the remote installation server properties, which allows you to determine how this RIS server responds to client computers requesting service.
- You can configure the advanced settings, which provide additional flexibility with regard to how client computers are installed.

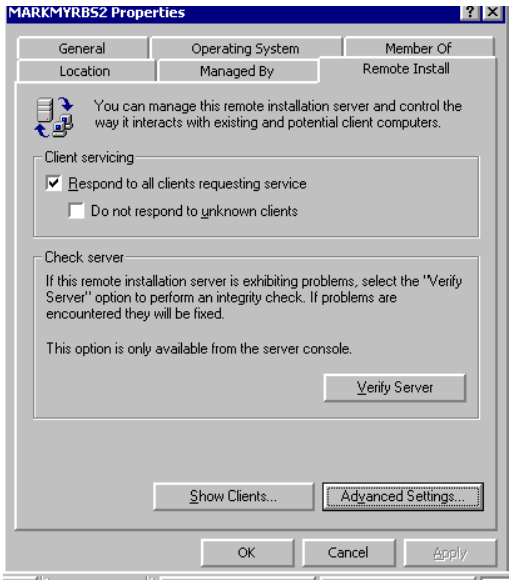
Configuring Remote Installation Server Settings

Locate your RIS server computer object within the Active Directory Users and Computers snap-in. Depending on the type of server, domain controller, or member

server of a domain, the server's computer object can be located in the Domain Controller Active Directory container or another container specified by the administrator at install time.

To configure the RIS settings

1. Right-click the **Servers Computer** object, and choose **Properties**.
2. Click the **Remote Install** tab. The following property page appears:



The server options control how this remote installation server responds to remote boot-enabled client computers requesting service. The remote installation server's property page offers the administrator the ability to *Show Clients* that have either been prestaged to this RIS server or that have already received an OS from this server. The property page also provides access to a Verify Server wizard and access to advanced settings, each of which are described in detail below.

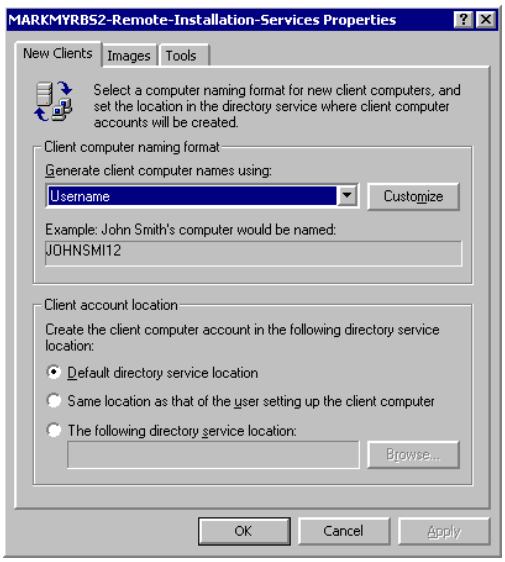
- **Respond to all clients requesting service**. This option controls whether this RIS server responds to client computers requesting service at the end of setup. If this option is checked, the server responds to clients and provides them with OS installation options. If cleared, this RIS server does not respond to clients requesting service.
- **Do not respond to unknown client computers**. This option controls whether this server responds to unknown client computers requesting a remote installation server. A client computer is known if the client computer has an existing computer account object created within the Active Directory. This setting allows the administrator to offer only *authorized* computers—that is, those computers that have been prestaged within the Active Directory—the OS installation options from this RIS server. This setting also provides support for multiple vendors Remote Boot/Install servers on one physical network. For example, if your company already

uses another vendor's remote install/boot server, you cannot control which vendor's server answers the client computers request. By setting this option in conjunction with prestaging client computers, you are assured that only those prestaged clients computers are serviced by this or other authorized RIS servers.

- **Verify Server**. This option gives the administrator the ability to check the integrity of the RIS server. If you suspect that the RIS server is failing or are currently seeing inconsistent behavior, click this option. This starts a wizard which ensures that all of the settings, services, and configuration options are correctly set and functioning. You may be prompted for one of the installation CDs, so be sure that you have those available prior to choosing this option.
- **Show Clients**. This option provides you with a list of client computers, sorted by globally unique identifier (GUID), that this server has serviced. The list also includes clients, again sorted by GUID, that have been prestaged to this server for OS installation.
- **Advanced Settings**. This option provides you with a suite of settings that control the way a client computer is installed. You can determine the automatic computer naming format and the Active Directory container that the client computer account is created in, as well as manage the images (OS or Tools) installed on this RIS server. For more information, see the section, "Configuring Remote Installation Advanced Settings," below.

Configuring Remote Installation Advanced Settings

To access the RIS Advanced Settings, select the **Advanced Settings** button from the RIS server property page. The Advanced Settings property dialog box displays a series of tabs, each containing specific configuration settings that affect how RIS services client computers.



New Clients Tab

The **New Clients** tab allows the administrator to define default behavior for remotely installing an OS on client computers. The administrator can define the automatic computer naming policy that is used during OS installation to provide the computer with a unique name. The computer name is used to identify the client computer on the network, similar to the older NetBIOS name used in previous versions of Windows NT and Windows.

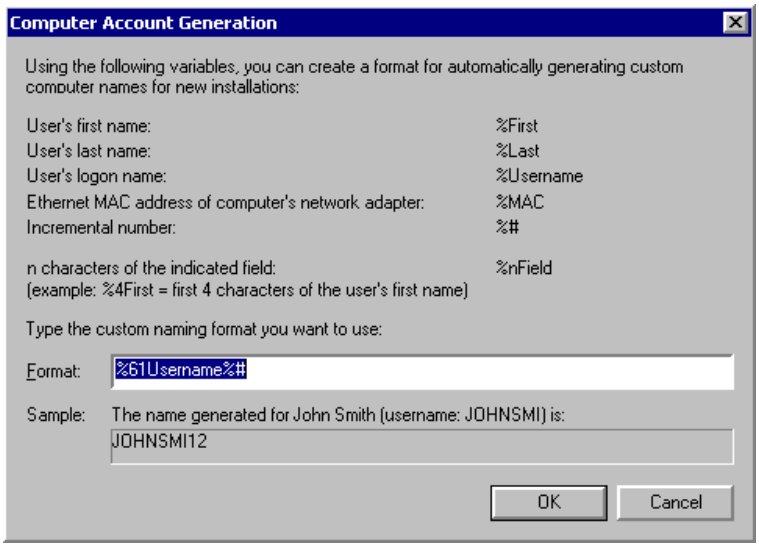
This tab also allows you to define a default Active Directory container for client computer account object creation. With this feature, you can group clients within a specific directory service domain or organizational unit (OU). During OS installation, Windows 2000 setup queries these settings to ensure the client computer is configured according to what the administrator has specified.

Note For all client computers using the RIS feature for OS installation to contain the same settings, all remote installation servers need to be configured in the exact same way. In this release, there is no support for replication of OS images or RIS configuration settings between RIS servers. You can use the replication capabilities of Microsoft Systems Management Server for image replication between RIS servers.

The **New Clients** tab contains the following options:

- **Client Computer Naming Format**. This option provides the administrator with a way to ensure that client computers are given a unique computer name during OS installation. If a company has a computer naming policy, for example all computers must be named using the user name plus a numerical designation (such as *JohnSmith01*), the administrator can preset this format prior to client computers powering on and requesting an OS installation. If the default computer naming formats do not meet the company's computer naming policy, the administrator can choose the **Customize** option and build a custom naming format using predefined keywords. An example of the customize

naming option dialog box is provided below:



- **Computer Account Location**. This option allows you to predefine a default directory service container that all remote installation client computer accounts are created in. You can choose one of three locations for machine account creation, as follows:
  - **Default directory service location**. Specifies that the computer account object for the client computer be created in the Active Directory location where all computer accounts are created by default during the domain join operation. The default Active Directory location is set to the *Computers* container within the Active Directory. The client computer becomes a member of the same domain as the RIS server installing the client.
  - **Same location as the user setting up the computer**. Specifies that the client computer account object be created within the same Active Directory container as the user setting up the machine. For example, if Sally logs on within the Client Installation wizard and her user account currently resides within the “Users” Active Directory container, the client computer account is created within the “Users” container in the Active Directory.
  - **A specific directory service location**. Allows the administrator to set a specific Active Directory container where all client computer account objects installing from this server are created. It is assumed that most administrators will select this option and specify a specific container for all remote installation client computer account objects to be created in.

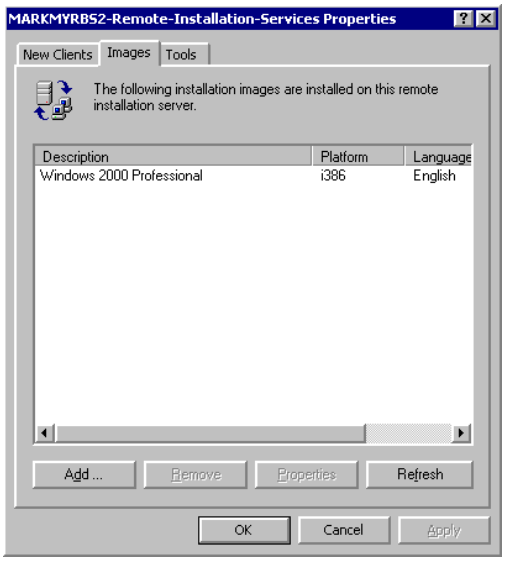
    Note If an end user is setting up the client computer, the user must have the appropriate rights to create the computer account within the domain or OU chosen. For more information on giving users computer account creation permissions, please see the RIS online documentation.

Images Tab

The **Images** tab is used for managing the client operating system images that are installed on a given RIS server. There are two types of images that are displayed on the **Images** tab:

- **CD-based**. CD-based images are images that are installed on the RIS server via the Remote Installation Setup wizard during initial RIS installation, or after by using the **Add** after the RIS installation. A CD-based image is simply a copy of the Windows 2000 Professional CD. This installs only the base operating system without applications or configuration settings.
- **Remote Installation Preparation (RIPrep)**. RIPrep images are a combination of the OS, locally installed applications, and configuration settings. Many companies today are standardizing on a single type of OS installation across their organization. Administrators are now able to install the base OS using RIS, install corporate standard applications, and configure the installation exactly how they want. Once the workstation is configured exactly as he or she wants it, the administrator runs the RIPrep.exe utility to create that image on an available RIS server.

  Once the image is replicated on the RIS server, new client computers requesting an OS installation can download the image, regardless of hardware differences between the source PC used to create that image. For more information on the RIPrep wizard and feature set, please see the section titled "Using the Remote Installation Preparation Wizard" later in the document.



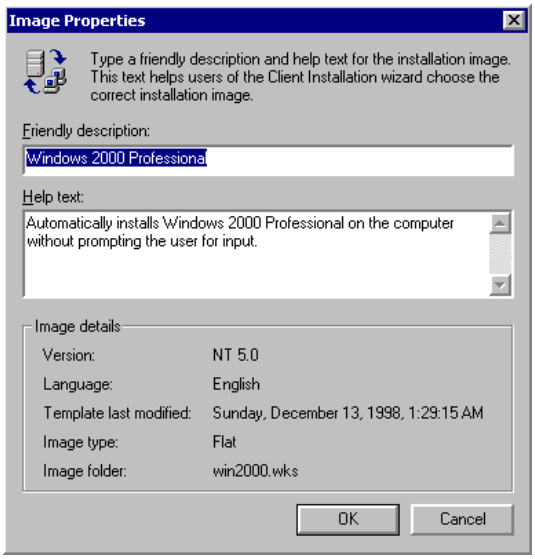
During the base installation of RIS, the administrator is prompted to add a default OS image (Windows 2000 Professional) to the RIS server. The **Images** tab is used to add, remove, or modify the properties of an operating system image that users have access to when using their client computers.

The following options are available on the **Images** tab:

- **Add**. Use the **Add** option to add a new CD-based OS image or to associate an unattended setup answer file (*.sif) to an existing CD-based image on the RIS server. Clicking **Add** starts the Add wizard, which presents both options. You can associate a number of unattended setup answer files to a single OS-based CD Image. This allows the administrator to offer users a variety of unattended Windows 2000 installation types, each performing a different type of installation, from the same OS image on the RIS server. RIS installs a default unattended setup installation (.sif) file with the default OS image that was added during RIS installation.

  Note You cannot use the **Add** option on the Images tab to add an RIPrep image, nor can you use the **Add** option to associate additional unattended setup answer files to a RIPrep image.

- **Remove**. Use the **Remove** option to remove the unattended setup answer file (*.sif) that is associated with the OS image. Note that this option removes only the .sif file. You should not remove the physical OS image completely until all client computers have upgraded to the next version of the OS. To remove the OS image from the remote installation server, use Windows Explorer and simply delete the directory and subdirectories containing the image you want to remove. Make sure that you back up the unattended setup answer files (*.sif) prior to removing any setup answer files with the remove.
- **Properties**. Use the **Properties** option to change the friendly description and help text used to describe the operating system image and to view the properties of that OS image. The friendly description and help text is displayed to users of the Client Installation wizard. If you want to change the description of an OS image, you can choose **Properties**.. The following dialog box appears:



If you replace the existing friendly description and help text with new text, all users of the client installation from that point forward see the new text descriptions. You can also use the **Properties** option to view specific image attributes, such as OS version, language, and the type of image (CD or RIPrep).

Tools Tab

The **Tools** tab is available for independent software vendors (ISVs) or original equipment manufacturers (OEMs) that would like to plug in their pre-boot tools for use with RIS. The **Tools** option is very similar to the Images tab, except that adding a tool is done outside of the remote installation server property page. ISVs or OEMs need to provide an external setup program that adds their respective tool to the \RemoteInstall directory tree. Once added, the tool shows up on the **Tools** tab and is available to administrators and users of the Client Installation wizard.

The **Tools** option allows ISVs or OEMs to provide pre-OS installation maintenance and troubleshooting tools to administrators, IT staff, or users. Since the client computer may have a blank hard drive prior to OS installation, the ability to troubleshoot hardware-related issues is imperative. It is also important to provide administrators with an easy way to update client computer systems, such as the system BIOS, prior to or post OS installation. The following options are available on the **Tools** tab:

- **Remove**. The **Remove** option removes only the template file (*.sif) associated with the currently highlighted tool. The tool vendor must provide a .sif file that points to the image to be executed. This .sif file also contains an entry for a friendly description and help text, which is used to indicate the specific purpose of the tool to users of a remote boot-enabled client computer. If you want to restrict user access to the tool, simply remove the .sif file via the **Remove** option or can set access permissions (ACLs) on the .sif file.
- **Properties**. The **Properties** option allows you to review and change the

friendly description, help text, and specific details about the tool selected.

Once the remote installation server and the advanced settings have been configured, the remote installation server is ready to support client computers. The next section discusses the client installation options and the overall process involved in rolling out Windows 2000 Professional.

INSTALLING CLIENT COMPUTERS USING REMOTE INSTALLATION

This section describes the steps required to successfully install Windows 2000 Professional on a Net PC, a Managed PC (PC 98 compliant system), or a PC that contains a network card supported by the remote installation boot floppy. To ensure a successful client installation, be sure to complete all prerequisites listed below.

Prerequisites for Client Installations

It is important to ensure that the following items are completed for client computers to receive an OS installation from a RIS server.

Verify Minimum Hardware

Ensure that the client computers being used meet the minimum client requirements documented within Appendix A. If client computers do not contain a supported DHCP PXE-based remote boot ROM, ensure that the network card being used is supported by the remote installation boot floppy. A complete list of supported adapters is available in Appendix A.

Set User Rights

The user account that is used to perform the OS installation on the client computer requires *Logon as a Batch* Job user rights. The steps below will assist you in setting Logon as a Batch Job user rights on a domain controller or a member server running the RIS services.

To grant users or administrators Logon as a Batch Job rights on a domain controller

1. In the Directory Management snap-in, right-click the **Domain Controllers Container,** click **Properties,** and then click **Group Policy**.
2. Select the **Default Domain Controllers Local Policy,** and click **Edit**, which starts the Group Policy snap-in.
3. Locate the user rights. Open the **Computer Configuration** folder, then open the **Windows Settings,** then **Security Settings**, then **Local Policies**, and then **User Rights Assignment**.
4. Right-click **Logon on as a Batch Job**, and choose **Security.** Add the **Everyone** account or specific user accounts that use RIS to the list. (The administrator account is not granted this right by default and must be added to the list.)

   Warning Security settings that have been set on a domain controller through the Group Policy snap-in do NOT take effect for the user or group accounts defined for up to several hours. For these rights to be applied immediately, start a command prompt on the domain controller that you set the user rights on (From the **Start** menu, click **Run,** and type *CMD*). Then type the following command:

   ```
   secedit /refreshpolicy MACHINE_POLICY
   ```

   Or you can reboot the server to apply the Group Policy settings immediately.

To grant users, administrators, or groups Logon as a Batch Job rights on a member server within a domain

1. On the stand-alone server, right-click the My Computer icon located on the desktop. Select the **Manage** option, and select the **System Tools** container.
2. From within the **System Tools** container, select **Group Policy**, click **Computer Configuration**, click **Windows Settings**, click **Security Settings**, click **Local Policies**, and click **User Rights Assignment.**
3. Right-click **Logon on as a Batch Job**, select **Security,** and click **Add**. Add the user, administrator, or security group containing the users that will be setting up remote boot-enabled client computers.

   Note See the Group Policy and Security walkthroughs, white papers, and online documentation for more information on the application of group policy objects and settings.

   Note The default administrator account does not contain the **Logon as a Batch Job** right by default. Therefore, the administrator account also needs to be assigned this right prior to client installation.

Set Required Permissions

If users are allowed to use RIS to install their own client computers, the administrator must ensure that those specific users have been granted the correct permissions for creating machine accounts within the domain, specifically the Organizational Unit container specified within the Advanced Settings on the RIS Servers. The steps outlined below should assist you in setting the correct permissions on a container that allows users the ability to use RIS to install their own computers.

To allow users to create computer accounts within a specific Active Directory Container

1. On the RIS server or any computer that has access to the Active Directory, start the Active Directory Users and Computers MMC snap-in. From the **Start** menu, point to **Programs**, point to **Administrative Tools**, and click **Active Directory Users and Computers.** Locate the container where the client computer accounts will be created by the RIS service. (See the section, “Configuring Remote Installation Advanced Settings” for specific information on where RIS creates client computer accounts.) By default, client computer accounts are created in the **Computers** container.
2. From the Active Directory Users and Computers snap-in, right-click the **Domain Name** at the top of the snap-in, and select the **Delegate Control** option.
3. A wizard starts and prompts for the following information:
   - Add users who are allowed to install their own computers using the RIS service. For ease of testing, you may simply add the **Everyone** group here. Click **Next** to continue.
   - Check the **Join a Computer to the Domain** option, and click **Next.** This

option allows the user or group of users to create, modify, and delete computer accounts within the container where you are delegating this right. Users are not able to modify or delete computer accounts that they did not create.

- Click the **Finish** button. Users are now able to create computer account objects during the OS installation using the RIS service.

Specify Installation Options

By default, the Client Installation wizard offers users restricted installation options. In other words, users are not given installation options by default; rather, they are offered the option to select an OS image for installation only if more than one image is available. To present specific installation options to users of the Client Installation wizard, you must edit the Default Domain Group Policy Object for the domain. For more information on setting specific RIS group Policy settings, see the section "Restricting Client Installation Options."

Configure the Network Card

Ensure that the client computer's network card has been set as the primary boot device within the system BIOS. When the client computer boots and is configured with the network card as the primary boot device, it requests a network service boot from the remote installation server on the network. Once contacted, the RIS server prompts users to preset the **F12** key to download the Client Installation wizard). Users should be instructed to press **F12** only if prompted, and only if they need a new OS installation or access to maintenance and troubleshooting tools. Once the OS has been installed via RIS, the user can ignore the request to press **F12** during future client computer reboots. If using the RIS boot floppy disk, simply insert the boot floppy into the drive and start the client computer. The computer boots from the floppy disk, and the user is requested to press **F12** to initiate the network service boot.

Note Compaq computer systems provide the ability to press the **F12** key during power up on PC98 or Net PC-based systems. In this case, the user is required to press **F12** on the Compaq Splash screen, and then press **F12** again when prompted by the RIS server.

Client Installation Wizard Overview

This subsection provides a short architectural overview of the new Dynamic Host Configuration Protocol (DHCP)-based Pre-Boot eXecution Environment (PXE) remote boot ROM sequence. It then provides a tour of the available client installation options that you can choose to present to users of the Client Installation wizard.

Remote Boot ROM PXE Architecture

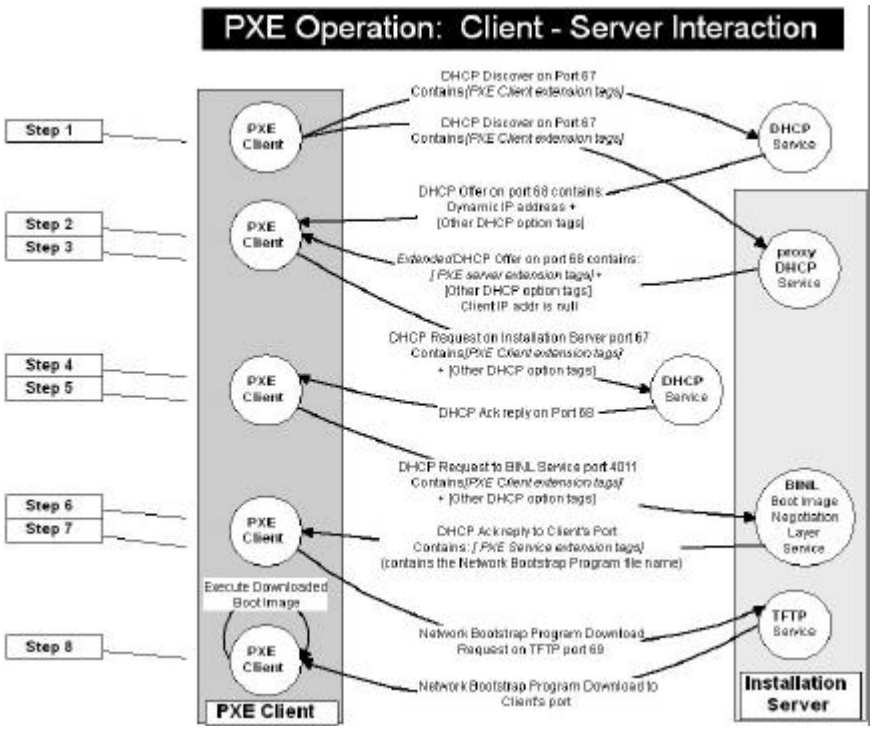
Remote Installation Services uses DHCP, following the Pre-Boot eXecution Environment architecture for boot strapping a client computer. When a new DHCP-PXE-based remote boot client computer is powered on for the first time, the client requests an Internet Protocol (IP) address, and the IP address of an active boot server via the DHCP protocol. As part of the initial request, the client computer

sends out its globally unique identifier (GUID or UUID), which is used to uniquely identify the client machine within the active directory, in the case of Windows 2000 Remote Installation Services.

The client computer receives an IP address from DHCP and also receives an IP address of the RIS server that will service the client. In the response from the RIS server, the client is passed the name of a boot image the client computer will need to request when contacting the RIS server for initial service. In the case of Windows 2000 RIS, once the client request is made, the first RIS server to respond will check the Windows 2000 Active Directory to see if this client has been prestaged or not.

Remote Installation Services does this by checking in the Active Directory for a computer account object that has the unique GUID/UUID that was passed by the client in the initial service request. If no computer account with that GUID exists and you have configured the RIS server to respond to all clients requesting service, the Trivial File Transfer Protocol (TFTP) is used to download the Client Installation wizard application when the user presses the **F12** key. After the wizard is downloaded to the client computer, the user is presented with a welcome screen and prompted to log on to the network. If you have configured the RIS server to only respond to known client computers (that is, clients prestaged in the Active Directory), the user does not receive the Client Installation wizard and is not able to install an OS image.

Below is a graphical representation of the Pre-Boot eXecution Environment (PXE) architecture that is documented in the Network PC Specification V 1.0b:



The overall PXE process is used every time a remote boot ROM-enabled client requests a network service boot. Remote boot/installation server vendors implement their own process to post the download of the first image.

The following sections describe the Microsoft implementation of remote installation. These sections also describe the installation options you can choose to present to users during the initial network service request.

Welcome and Logon

When a new remote boot-enabled client computer powers on for the first time, the user is requested to press the **F12** key to initiate the download of the Client Installation wizard. Once the wizard is downloaded to the client computer, the user sees a welcome screen. This screen is the first screen downloaded to the client computer that requested a network service boot. You can customize the welcome screen to convey a specific company message or to provide additional information to users prior to OS installation.

The RIS server can be configured to offer multiple OS language choices to users within a company. In European countries, it is not uncommon for a company to have many language-specific operating systems. In this case, the welcome screen can be customized to offer users a choice of which country (language) specific version of the OS they would like to install. RIS provides a sample multi-language welcome screen called *Multilng.osc* that can be used to offer multiple OS languages from a single RIS server. The Multilng.osc file is a simple text file that contains instructions on customizing the file. Use the Notepad.exe application to review and edit this file for use with RIS.

Once the user has read the welcome, he or she is prompted to log on to the network with an existing user account, password, and logon domain. Once the user has successfully logged on, RIS checks to see what installation options the user should have access to based on the group policy settings that have been defined. The Client Installation wizard presents the user with a menu with the appropriate installation options specifically tailored to that user. RIS has been configured so that a default user will not be presented with installation options by default, rather the **Automatic setup** option is chosen automatically. In the case of an administrator-based account, all installation and maintenance options are displayed by default.

Client Installation Options

There are four installation options that you can choose to present to a user of the Client Installation wizard. These options are:

- Automatic setup
- Custom setup
- Restart a previous setup attempt
- Maintenance and troubleshooting

The available installation options a user has access to are determined by the specific Remote Installation Services Group Policy settings that have been defined for the site, domain, and OU, in conjunction with the specific security group or user account. For example, you can choose to provide all members of the help desk security group access to all of the installation options, yet restrict general network users to just the Automatic setup and Maintenance and troubleshooting options. This prevents user confusion and helps guide the user to the correct choices for OS installation. By default, users are not given installation options, but are provided with a selection of OS images if more than one image exists.

Automatic Setup

The Automatic setup option is the default installation option that is enabled for all users of the Client Installation wizard. If this is the only installation option available to a user, when the user logs on within the Client Installation wizard, he or she does not see the automatic setup option. Instead, the Client Installation wizard jumps directly to the OS images selection screen. If there is only one OS image offered, the user simply logs on within the Client Installation wizard and is asked to confirm the installation at the Caution screen. If more than one OS image is available for installation, the user has a choice of which OS to install. Note that you can configure the RIS server to allow the user to see only specific OS images. For more information on restricting OS image access, see the section titled “Restricting OS Image Options,” later in this document.

As the RIS administrator, you can decide to offer a user multiple OS image choices. In this case, the user is able to select the OS image that best fits his or her needs or role within the company. By default, RIS uses the unattended setup answer files for OS installation, which means that when a user selects one of the OS images offered, the OS is installed without prompting the user for input.

By using an unattended installation setup answer file (*.sif), you can create several unattended OS installations that are associated with one CD-based OS image on the remote installation server. You can customize which items are installed, as well as how the specific OS options are to be configured during OS install.

For example, you can choose to create a specific OS unattended setup answer file (*.sif) that installs the TCP/IP protocol, sets the display resolution to 800 x 600, and sets a specific company or department name. You should provide a friendly description for this OS image that the user can relate to such as, **Windows 2000 Professional for Sales Staff.** The friendly description can be anything you choose and is configurable after the initial posting of the workstation OS image on the RIS server. When a user logs on, he or she is presented with a list of OS installation images to choose from.

When the user selects one of the operating system images, the user is cautioned that an operating system is about to be installed on this computer, and that the operating system requires the local hard disk to be repartitioned and formatted, thus erasing all data that currently resides on the disk.

Note An administrator can edit the "Caution.osc" screen using the Notepad.exe program to provide a friendly message regarding the repartition and format of the local hard disk.

By preconfiguring the RIS settings prior to servicing client computers, you predefine the automatic computer naming policy and the location within the Active Directory where the new client computer account objects is created. For more information on configuring specific RIS settings, see the sections, "Configuring Remote Installation Services Settings" and "Configuring Remote Installation Advanced Settings."

Custom Setup

The **Custom** setup option is very similar to the **Automatic** option, yet provides the administrator or help desk staff with the ability to set up a client computer for someone else within their organization. This option can be used to prestage a client computer into the Active Directory prior to delivery of the PC to the end user.

Because RIS is configured to automatically generate computer names based on the user logging into the client computer, it is not appropriate to use the **Automatic** setup option for setting up another user's computer. In this situation, you would choose the **Custom** setup option. This allows you to override the automatic computer name assignment, as well as the computer account creation mechanism. You are prompted to manually enter a computer name or the Active Directory location where the computer account should be created.

You can choose to accept the default settings or manually enter new ones. Once the settings have been made, depending on how the RIS has been configured, you are provided with a choice of the OS image to install or the caution screen appears, indicating an OS is about to be installed.

Note Windows 2000 Remote Installation Services do not support fully unattended installations on

machines that contain ISA or non Plug and Play aware devices.

Restart a Previous Setup Attempt

This option provides the administrator or help desk staff the ability to restart a failed setup attempt. If you started to install the OS and for some reason lost your connection to the RIS server, you can reboot the client computer, press **F12** when prompted for a network service boot, and choose the Restart a Previous Setup Attempt. This restarts the installation of the previous installation attempt without asking for computer name or Active Directory location previously entered prior to the initial failure.

Maintenance and Troubleshooting

This option provides access to third-party ISV and or OEM Pre-OS maintenance and troubleshooting tools. There are a couple of vendors that already provide RIS-based maintenance and troubleshooting tools. You can retrieve these tools from the following locations:

- **Vendor**: AMI

  Available tool: Pre OS AMIDIAG

  Product description: Amidiag is an ideal tool for preboot troubleshooting. Amidiag offers the most complete and accurate system information and diagnostics available on the market. Amidiag includes information and diagnostics for all PC components, including System Board, CPU, Memory, BIOS, ISA, PCI, EISA, IRQ, DMA, I/O Ports, SCSI, ATAPI, USB, AGP, hard-disk drives, floppy drives, CD-ROMs, network, power management, Plug and Play, keyboard, mouse, video, and multimedia. Amidiag has a simple and friendly graphical user interface with separate Basic and Advanced sections and Report Generation facility.

  Download Location: http://www.ami.com/ and choose the Utility products on the top toolbar.

  Product Contact Number: (770) 246-8600

- **Vendor:** Phoenix Technologies

  Available tool: Preboot Agent Version 3.0

  Product description: Preboot Agent is stored in the Flash-ROM of an x86-based computer system (the *Target*) and can be used to connect the Target to a host machine on the same network before the Target has booted an Operating System. On boot failure of the Target, the Preboot Agent establishes contact with the Preboot Manager application running on the Host machine. An operator at the host can then control the Target machine using keyboard and video redirection. On OS and diagnostic utilities can be downloaded to that target and controlled remotely. Preboot Manager can also allow the Host operator to remotely control a Windows 2000 RIS or PXE session running on the Target machine.

Download Location: http://www.award.com/prodbrfs/brfmpc.htm

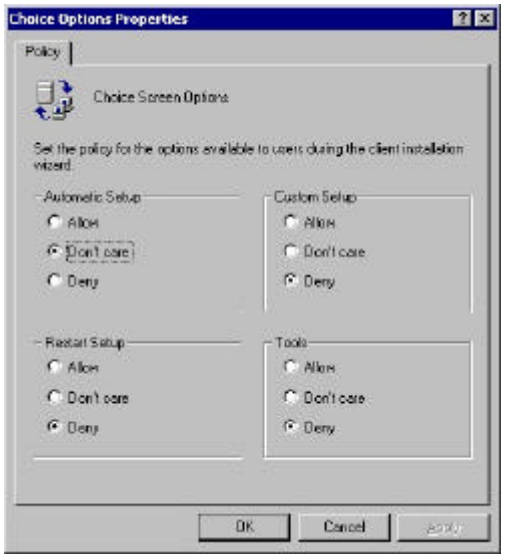
Product Contact Number: (949) 790-2221

Restricting Client Installation Options

To restrict the client installation options for users of RIS within your organization, you must set the desired Group Policy settings for the RIS servers on your network. To set which client installation options are offered to users, you need to locate the RIS policy settings and set the appropriate options. If you are not familiar with group policy, please see the *Group Policy Technical Walkthrough.*

To set RIS installation option Group Policy settings

1. Locate the Active Directory container where you would like the RIS policy settings to be set. By default, the RIS policy settings are applied within the **Default Domain Policy Object,** which is located at the root of your domain.
2. Right-click the domain root name, and choose the **Properties** option.
3. Select the **Group Policy** tab from the available tabs at the top of the **Properties** dialog box.
4. Select the **Default Domain Policy** object from the group policy object links window, and click **Edit.**
5. Expand the **User Configuration** option by clicking it, and then expand the **Windows Settings** option. Select the **Remote Installation Services** option.
6. You see the **Choice Options** in the right pane. Double-click this icon, and the following dialog box appears:



Each of the Client Installation wizard installation options is listed within the RIS group policy settings dialog. Each installation option allows for a specific setting, as follows:

- **Allow.** If this option is selected under the specific installation option, the users that this policy is applied to are offered the installation option.
- **Don't Care.** If this option is selected, the administrator has chosen to accept the policy settings of the parent container. For example, if the administrator for the entire domain has set RIS specific policy, and the administrator of this container has chosen the **Don't Care** option, the policy that is set on the domain is applied to all users who are affected by that policy.
- **Deny.** If this option is set for a specific installation option, the users that are affected by this policy are not allowed to access that installation option within the Client Installation wizard.

It is important that you understand the effects of group policy within your organization before setting specific policy for your users or computers. Please review the *Group Policy* walkthrough document as well as the Group Policy white papers that are available with the Windows 2000 Beta 3 release.

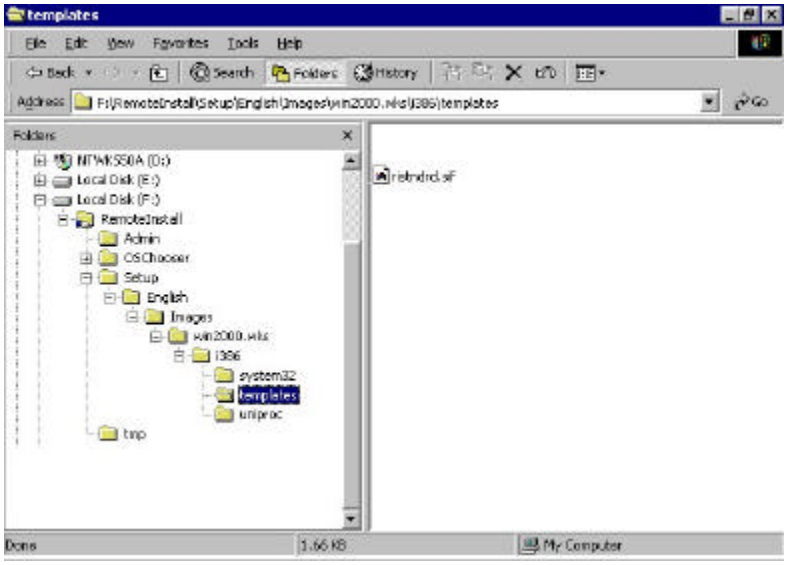
Restricting OS Image Options

RIS provides the administrator flexibility with regard to the amount of control a user has in choosing the OS that is installed on his or her computer. The administrator can configure the RIS servers in a way that guides users through a successful OS installation, without requiring the user to select the correct OS image.

By setting explicit user or group security permissions on the unattended setup answer file (*.sif) for a given OS image, you can determine which OS options a user can see, and thus install. You can choose to allow all users of RIS to choose from all of the OS images available on a given RIS server or you can restrict the user to only a select few that are appropriate for that user or group of users.

To restrict access to the available OS images

1. Locate the RemoteInstall\Setup*OS Language*\Images*OSImageName*\Templates directory on the RIS server. A sample directory structure is shown below.

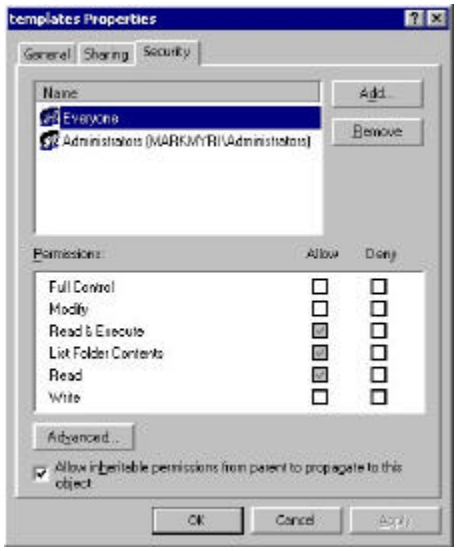


Note Each CD-based OS image that you add to a RIS server has an associated \Templates directory that contains the unattended setup answer files (*.sif) that are associated with that image.

Depending on the level of restriction that you want to establish, you can set specific access permissions on the **\Templates** directory or in the individual unattended setup answer files that are contained within this directory. If you have not associated additional unattended answer files to the base OS image, you will only see one SIF file (Ristndrd.sif) within the **\Templates** directory.

2. Right-click the **\Templates** directory, and click the **Properties** option. The property page for the **\Templates** folder appears.

3. Select the **Security** tab. The following dialog box appears:



In this example, the existing security permissions allow all users access to this

OS image from within the Client Installation wizard.

4. To restrict access to this OS image, select the **Everyone** group, and click **Remove.** This removes user access to this OS image. If a normal user were to run the Client Installation wizard at this point, he or she would not have access to any available OS image to install.

5. Click **Add,** and select the security group or individual users that should be allowed access to this OS image. Click **Add** to add them to the authorized list, and then click **OK** twice. The default permissions that are set for each user or security group are sufficient for use with RIS.

   Note Selecting individual users for specific access can become an administrative burden. It is recommended that you group your users by security group and apply the security group to the **\Templates** directory for OS image access. This way if you add users to the security group, they are already provided access to the correct OS image.

At this point, you are ready to service client computers with RIS. Ensure that all services are running, all configuration settings have been made, and that the client computers adhere to the minimum requirements. The following sections describe additional features that are provided with RIS.

Remote Installation Preparation Wizard (RIPrep)

The Remote Installation Preparation wizard (**RIPrep.exe**) provides the combined ability to prepare an existing Windows 2000 Professional installation, including locally installed applications and specific configuration setting, and replicate that image to an available RIS server on the network. The RIPrep feature currently supports replication of a **single disk single partition (C Drive only)** Windows 2000 Professional Installation. This means that the OS and all of the applications that make up the standard installation must reside on the C drive prior to running the wizard.

You first use the RIS feature to remotely install the base Windows 2000 Professional OS on a client computer. Once the OS is installed, you can install any application, including in-house line of business applications on the client computer. You can then configure the installation to adhere to any company policies. For example, you may choose to define specific screen colors, set the background bitmap to a company-based logo, and set intranet proxy server settings within Internet Explorer. Once the workstation is configured exactly the way the you want it to be and has been heavily tested, you are ready to run the Remote Installation Preparation wizard (RIPrep.exe) from the RIS server that will receive the RIPrep-based OS image.

One of the exciting features of RIPrep utility is that the destination computer (that is, the computer that installs the image) does not need to have identical hardware as that of the source PC used to create the image. The exception is that the Hardware Abstraction Layer (HAL) drivers must be the same (for example, they both must be

ACPI-based or both must be non ACPI-based). In many cases, workstation class computers do not require unique HAL drivers as server class machines do. The RIPrep utility uses the new Plug and Play support that ships with Windows 2000 for detecting any differences between the source and the destination PCs hardware during image installation time.

Note Different hardware between the source and destination computers is not currently supported in RC0 or RC1 of Windows 2000 RIS. This support will be available in the Beta 3 release of Windows 2000 RIS.

To run the Remote Installation Preparation wizard (RIPrep.exe)

1. Install the base Windows 2000 Professional OS from an available RIS server on a supported client computer.
2. Install any applications locally on the client computer. Configure the client computer with any specific corporate standard desktop settings. Be sure the client installation is exactly as you want it to be. Once the image is replicated to the RIS server, you cannot alter its configuration.
3. Connect to the RIS server where you want to replicate this image, as follows:
   - Choose the **Start** button from the system tray on the workstation.
   - Choose the **Run** option, and type the following command in the Open text box:

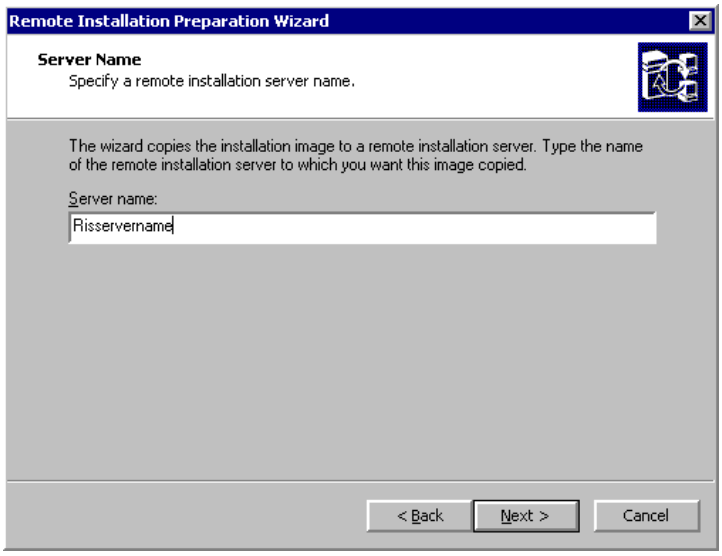
     ```
     \\RISservername\Reminst\Admin\RIPrep.exe
     ```

     where
     RISservername is the computer name of the RIS server where you want to replicate this image.
     Reminst is the Remote Installation Share that is created when you installed the RIS service on the server.

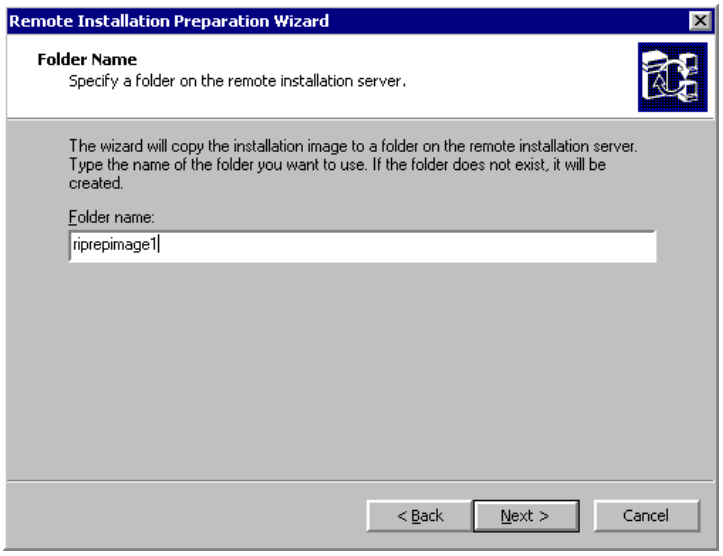
Admin is the directory that contains the RIPrep.exe that launches the remote installation

At this point, the Remote Installation Preparation wizard starts and you are presented with the following welcome screen that describes the feature and its functionality:

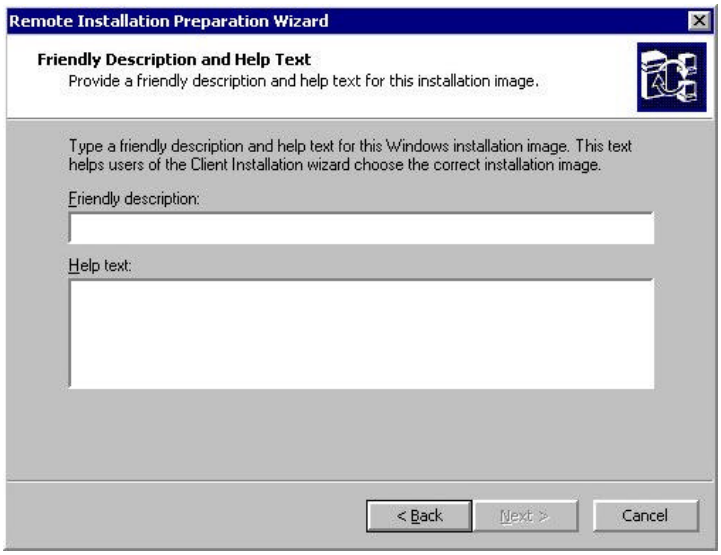
4. You are prompted to enter the name of the RIS server where you would like to replicate the contents of the client hard disk. By default, the RIS server that the wizard (RIPrep.exe) is being run from is filled in automatically, as follows:



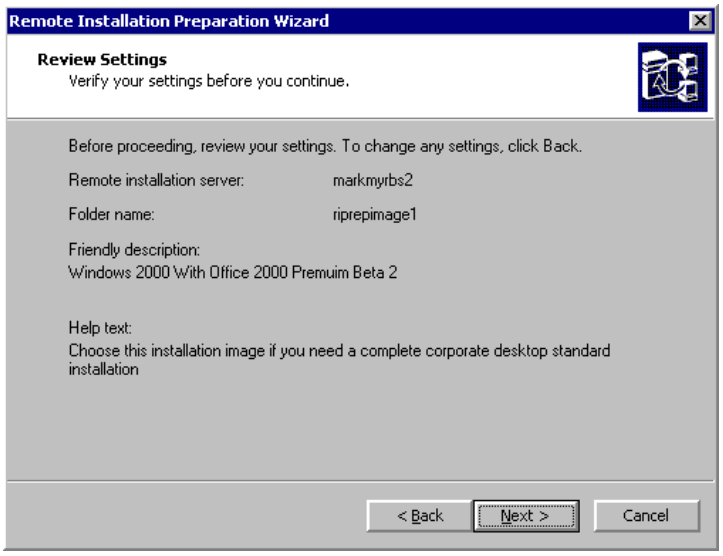
5. You are prompted to provide the name of the directory on the RIS server where this image will be copied. The image is created automatically under the \remoteInstall\setup*OS Language*\Images directory.



6. You are prompted to provide a friendly description and help text describing this image. The friendly description and help text are displayed to users of the Client Installation wizard during OS image selection. Provide enough information that a user can distinguish between images.



7. After you complete the interactive portion of the Remote Installation Preparation wizard, the wizard allows you to review your choices and selections by displaying the following summary:



8. After you review the summary screen, click **Next.** The image preparation and replication process begin. The system is prepared and files are copied to the RIS server specified. Once the replication of the image completes, any DHCP PXE-based remote boot enabled client computer, including those clients using the Remote Installation Boot Floppy, can select the image within the Client Installation wizard for a local installation.

Remote Installation Boot Floppy

The remote installation boot floppy can be used with computers that do not contain a remote boot-enabled ROM on the network card. The boot floppy is designed to simulate the PXE boot process for computers that lack a supported DHCP PXE-based remote boot ROM. The boot floppy generator utility is located on every Remote Installation Server within the \RemoteInstall\admin directory. There you will find a file called RBFG.exe, which is used to create a boot floppy for use with RIS.

When you create a boot floppy, all of the network adapter cards listed in the Adapter List option are supported on that floppy. The RBFG.exe utility is also contained within the Administrator Tools package that ships with Windows 2000 Server. The Administrator Tools package can be deployed across your organization using either Systems Management Server 2.0 or using the new Software Management feature, which is part of the Group Policy infrastructure. If you install the administrator tools package on a computer, from the **Start** menu, click **Run,** and in the **Open** text box, type

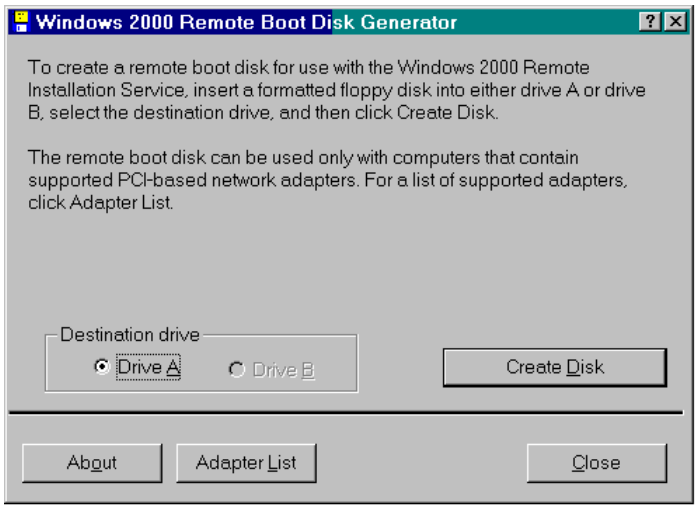
```
RBFG.exe
```

The RBFG.exe utility is copied to the “<Windir>\System32” directory when the Administrator Tools package is installed.

Creating a Remote Installation Boot Floppy

To create a Remote Installation Boot Floppy, run the RBFG.exe utility from the RIS

server, on a client computer that is connected to the RIS server, or on a computer that has the administrator tools package installed. The RBFG.exe floppy generator starts and presents the following options:



To see a list of network adapters supported, click **Adapter List**. To create a remote installation boot floppy, insert a floppy disk in the appropriate drive and then select **Create Disk**. The RBFG.exe utility does not allow you to add network adapters. Microsoft will be updating the RBFG.exe utility to include additional network adapters in the future.

CONCLUSION

The information presented in this walkthrough document has provided the technical details required to install, configure, and use Microsoft Remote Installation Services. RIS helps to reduce the costs associated with deploying Windows 2000 Professional throughout the enterprise.

Remote Installation Services require several of the Windows 2000 Server technologies—Active Directory, DHCP server, and the DNS server services. The remote installation sever also requires that client computers contain either the new DHCP PXE-based remote boot capable ROMs or a network card that is supported by the remote installation boot floppy.

Please install and test the remote installation server and send us your feedback. If you run into problems, please review Appendix B “Frequently Asked Questions” for additional information.

FOR MORE INFORMATION

For the latest information on Microsoft Windows 2000 network operating system, visit our World Wide Web site at http://www.microsoft.com/windows/server/ and the Windows NT Server Forum on the Microsoft Network (GO WORD: MSNTS).

For the latest information on the Windows 2000 Beta 3, visit the World Wide Web site at http://ntbeta.microsoft.com/.

Before You Call for Support

Please keep in mind that Microsoft does not support these walkthroughs. The purpose of the walkthroughs is to facilitate your initial evaluation of the Microsoft Windows 2000 features. For this reason, Microsoft cannot respond to questions you might have regarding specific steps and instructions.

Reporting Problems

Problems with Microsoft Windows 2000 should be reported via the appropriate bug reporting channel and alias. Please make sure to adequately describe the problem so that the testers and developers can reproduce it and fix it. Refer to the Release Notes included on the Windows 2000 Beta distribution media for some of the known issues.

APPENDIX A

Remote Installation Server and Workstation Hardware Requirements

Server hardware requirements

- Pentium or Pentium II 200 MHz recommended (P166 minimum)
- 64 MB of RAM minimum. If additional services such as the DS, DHCP, and DNS are installed then the minimum amount of RAM is 96 or 128 MB
- 2-GB drive dedicated to the Remote Installation Servers directory tree
- 10 or 100mb/s network adapter card (prefer 100mb/s)

Note You should dedicate an entire hard drive specifically to the Remote Installation Services directory tree. (SCSI-based disk controller/disks are preferred.)

Client hardware requirements

- Pentium 166 MHz or greater NetPC client computer
- 32 MB of RAM
- 1.2-GB drive minimum
- PXE DHCP-based boot ROM version .99c or greater or a network card supported by the RIS boot floppy

Tested PCs

The following computers have been tested with this build of Windows 2000 RIS:

- Acer Power Net PC
- Compaq DeskPro EN series with a .99L version of the PXE Boot ROM
- Dell Lattitude Laptops: Latitude CP, Latitude CPi, Latitude CPi A300, A366 used in conjunction with the C/Port and the C/Dock docking stations
- Dell Optiplex Net PC N and NX models (requires updated PXE ROM BIOS from Dell to .99L revision)
- Gateway PC 98 and beyond compliant computer systems
- Hewlett-Packard NetVectra Net PCs
- Toshiba Portégé 7010 CT and Tecra 8000 models with the Network Port Replicator containing the Intel 100 network card complete with a PXE Boot ROM version .99L. This docking station is also supported with the RIS Boot Floppy.

Note The Compaq Deskpro Net PC's models 4000 N and S are not supported with this beta release of Windows 2000 RIS due to problems discovered during testing.

Network Cards supported by RIS Boot Floppy

3 Com Network Adapters

- 3c900 (Combo and TP0)
- 3c900B (Combo, FL, TPC, TP0)
- 3c905 (T4 and TX)
- 3c905B (Combo, TX, FX)

AMD Network Adapters

- AMD PCNet and Fast PC Net

Compaq Network Adapters

- Netflex 100 (NetIntelligent II)
- Netflex 110 (NetIntelligent III)

Digital Equipment Corporation (DEC) Network Adapters

- DE 450
- DE 500

Hewlett-Packard Network Adapters

- HP Deskdirect 10/100 TX

Intel Corporation Network Adapters

- Intel Pro 10+
- Intel Pro 100+
- Intel Pro 100B (including the E100 series)

SMC Network Adapters

- SMC 8432
- SMC 9332
- SMC 9432

APPENDIX B

Frequently Asked Questions

Question: How do I know I have the correct PXE ROM version?

Answer: When the NetPC or client computer containing a remote boot ROM-boots, a PXE (LSA) ROM message appears on the screen. You should see which version of the PXE ROM code is displayed during the boot sequence of the client machine. Windows 2000 RIS supports .99c or greater PXE ROMs. You may be required to obtain a newer version of the PXE-based ROM code from your OEM in the event you are not successful with this existing ROM version.

Question: How do I know if the client computer has received an IP Address and has contacted the Remote Installation Server?

Answer: When the client computer boots, the PXE Boot ROM begins to load and initialize. The following sequence occurs with most Net PC or PXE ROM-based computers:

Remote Boot ROM Load Sequence

Step 1: The client computer displays the message **BootP**. This message indicates the client is requesting an IP address from the DHCP server.

Troubleshooting: If the client does not get past the BootP message, it means the client is not receiving an IP address. Things to check are:

- Is the DHCP server available and has the service started? DHCP and RIS servers MUST be authorized in the Active Directory for their services to start. Check to ensure the service has started and other non remote boot-enabled clients are receiving IP addresses on this segment.
- Does the DHCP server have a defined IP address scope and has it been activated?
- Is there a router between the client and the DHCP server that is not allowing DHCP packets through?
- Are there any error messages in the event log under the System Log for DHCP?
- Can other client computers—that is non-remote boot-enabled clients—receive an IP address on this network segment?

Step 2: When the client receives an IP address from the DHCP server, the message changes to **DHCP**. This indicates the client successfully leased an IP address and is now waiting to contact the Remote Installation Server.

Troubleshooting: If the client does not get past the DHCP message, it means the client is not receiving a response from the remote installation server. Things to check are:

- Is the remote installation server available and has the (BINLSVC) RIS service started? RIS servers MUST be authorized to start on the network. Ensure the RIS servers are authorized to run on the network. Use the DHCPMGMT.MSC snap-in to authorize both DHCP and RIS servers within

the Active Directory.

- Are other remote boot-enabled clients receiving the Client Installation wizard? If so, this may indicate this client computer is not supported or is having remote boot ROM-related problems. Check the version of the PXE ROM on the client computer.
- Is there a router between the client and the remote installation server that is not allowing the DHCP-based requests/responses through? The RIS server communicates via the DHCP packet type during the initial service request/response sequence.
- Are there any error messages in the event log under the System or Application logs specific to RIS (BINLSVC), DNS, or the Active Directory?

Step 3: The client then changes to **BINL** or prompts the user to click the **F12** key. This means that the client has contacted the RIS server and is waiting to TFTP the first image file—OSChooser. You may not see the BINL and TFTP message as on some machines as this sequence simply flashes by too quickly.

Troubleshooting: If the client machine does not get a response from the Remote Installation Server, the client times out and displays an error that it did not receive a file from either DHCP, BINL, or TFTP. In this case, the RIS Server did not answer the client computer.

Stop and restart the BINLSVC. From the **Start** menu, click **Run**, and type **CMD**. Enter these commands:

Net Stop BINLSVC

Net Start BINLSVC

If the client machine does not receive an answer after attempting to stop and restart the service, then check the Remote installation Server Object properties to ensure the correct setting has been set. Check the Event log on the RIS server for any errors relating to DHCP, DNS, or RIS (BINLSVC). If possible, capture the network activity between the server and the client with a network sniffer and follow the instructions in the For More Information section of this document.

Step 4: At this point, the client should have downloaded and displayed the Client Installation wizard application with a Welcome screen greeting the user.

Question: Does RIS support remote installation of Windows 2000 Server CD-based or RIPrep OS images?

Answer: No. RIS does not support remotely installing Windows 2000 Server. This is currently being investigated as a feature for the next full version of RIS.

Question: Does RIS support remotely installing an OS image (RIPrep or CD-based) on laptop computers?

Answer: Yes and no. RIS currently is being tested with laptop computers with

network-based docking stations that support the PXE ROM code required to remotely install the laptop contained within the NetDock stations. Toshiba is currently in the process of selling specific laptop models that support this feature. The systems that we have started to test with are the Toshiba Portégé 7010CT and the Toshiba Tecra 8000 with the NetDock Port replicator. The systems must be located within the Network Dock Port replicators with the network cable plugged into the network adapter located with the NetDock. For these systems to function with RIS, they require the 99L or greater version of the PXE ROM code for the specific network card located within the NetDock.

RIS does not support laptop computers that contain PC Card or PCMCIA cards that contain a PXE supported ROM. RIS has not been tested with laptops that are contained within a formal docking station that contains a network adapter with a supported ROM or are being remote booted with the RIS boot floppy.

Question: Is the Pre-Boot portion of the PXE-based Remote Boot ROM Secure?

Answer: No. The entire ROM sequence and OS installation/replication is not secure with regard to packet type encryption, client/server spoofing, or wire sniffer based mechanisms. As such, use caution when using the RIS service on your corporate network. Ensure that you only allow authorized RIS servers on your network and that the number of administrators allowed to install and or configure RIS servers is controlled.

Question: Can RIPrep-based OS images be replicated to alternate media such as DVDs, CDs, and/or Zip drives?

Answer: No. This is something that is being looked at for the next major release of RIS.

Question: Does the RIPrep feature of RIS support different hardware between the source computer used to create the RIPrep-based OS image and the destination computer that will install the image?

Answer: Yes. The hardware between the source PC and the destination PC can be different. The one exception to this is the Hardware Abstraction layer (HAL) driver used. For example, if the source PC is an Advanced Configuration Power Interface (ACPI)-based computer, it uses a specific ACPI HAL driver. If you attempt to install this RIPrep image on a non-ACPI-based or enabled computer, it will fail.

Question: Does the RIPrep wizard support multiple disks and or multiple partitions on a given client computer?

Answer: No. The RIPrep utility only supports a single disk with a single partition (C:\ drive) in this release of RIS.

Question: How does the RIPrep wizard deal with disks that differ in size between the source PC used to create the image and the destination PC that will receive it.

Answer: The destination PC's disk size must be equal to or larger than the source disk used to create the image. For example, if the source computer has a 1

gigabyte drive, when you install that image on the destination computer that has a 2 gigabyte drive, it will format for 1 gigabyte and copy the OS image. The extra 1 gigabyte is left in the RAW (non-formatted) state. This allows administrators to script the type of partition and file format at a later time.

Question: How do I replicate all of the OS images currently located on one of my RIS servers to other RIS servers on the network for consistency across all client installations?

Answer: Currently the RIS feature does not provide a mechanism for replication of OS images from one RIS server to another. There are several mechanisms that can be employed to solve this problem. Take advantage of the strong replication features of the Systems Management Server product. This product provides for scheduled replication, compression, and slow link features. You can also employ third-party vendor solutions for OS image replication. Ensure that the replication mechanism supports maintaining the file attributes and security settings of the source images.

Question: Can I have an RIS server and a third-party remote boot server on the network at the same time? If so, what are the implications?

Answer: Yes. You can have multiple vendor Remote Boot/Installation (RB/RI) servers on one physical network. It is important to understand that currently the remote boot PXE ROM code does not know the difference between vendors RB/RI servers. As such, when a remote boot-enabled client computer powers up and requests the IP address of a RB/RI server, all of the available servers respond to that client, thus the client has no way to ensure it is serviced by a specific RB/RI server.

RIS allows an administrator the ability to prestage client computers into the Active Directory and mandate which RIS server services that client. By configuring the RIS server to only answer known client computers (prestaged), the administrator is assured that the client is serviced by the correct RIS server. Not all of the third-party RB/RI vendors have implemented the ability to ignore service requests and as such you may need to segment off the specific vendors servers on the network so that clients are not answered by these vendors RB/RI servers.

Question: Can I remotely manage the RIS servers from Windows 2000 professional workstations on my network.

Answer: Yes. If you are an administrator in the domain and you have installed the Administrator Tools MSI package, you can administer the majority of the RIS configuration settings. There are some items that you cannot manage. For example, you cannot remotely add additional OS images to RIS servers from Windows 2000 workstation computers.

Question: Can I add additional network adapter cards to the RIS Boot Floppy?

Answer: No. The RBFG.exe utility is hard-coded with regard to the number of supported network card adapters for this release of RIS. Microsoft will be adding

additional network card adapters over time. Microsoft makes the updated RBFG.exe utility available through normal distribution channels such as the Web, Windows Update, and future service/feature pack updates.

Question: Can I use the Active Directory object attributes to create a naming format for use with the RIS automatic computer-naming feature?

Answer: No. Currently the existing attributes supported with the automatic computer-naming feature leverage the Active Directory. However, all of the Active Directory object attributes are not currently supported. This is something that is being investigated for a future release of RIS.

Question: Where do I look on the client computer to find the GUID/UUID for pre-staging clients in the Active Directory for use with RIS?

Answer: The GUID/UUID for client computers that are PC98 or Net PC compliant can in most cases be found in the system BIOS of the computer. OEMs are encouraged to ship either a floppy disk containing a comma-separated file or spreadsheet that contains a mapping of Serial # to GUID/UUID. This allows you to script prestaging client computers within the Active Directory. OEMs are also encouraged to post the GUID/UUID on the outside of the computer case for easy identification and prestaging of computer accounts. If the GUID is not found in the above-mentioned locations, you can sniff the network traffic of the client, locate the DHCP Discover packet, and within that field will be the 128-bit 32 byte GUID/UUID.